Learning Objectives

In this concept, you will learn to interpret scale drawings and floor plans.

Scale Drawing

A scale drawing or floor plan is a representation of an actual object or space drawn in two-dimensions. For a floor plan, you can imagine that you are directly above the building looking down. The lines represent the walls of the building, and the space in between the lines represents the floor.

In order to find the actual dimensions from a floor plan, you can set up and solve a proportion. The scale given in the drawing is the first ratio. The unknown length and the scale length is the second ratio.

Let’s look at an example.

The floor plan below shows several classrooms at Craig’s school. The length of Classroom 2 in the floor plan is 2 inches. What is the actual length, in feet, of Classroom 2?
First, set up a proportion. The scale in the drawing says that $\frac{1''}{2'} = 3'$, therefore the proportion is:

$$\frac{0.5 \text{ inches}}{3 \text{ feet}}$$

Next, write the second ratio. You know the scale length is 2 inches. The unknown length is $x$. Make sure that the second ratio follows the form of the first ratio: inches over feet.

$$\frac{0.5 \text{ inches}}{3 \text{ feet}} = \frac{2 \text{ inches}}{x \text{ feet}}$$

Then, cross-multiply.

$$\frac{0.5}{3} = \frac{2}{x}$$

$$0.5x = 2 \times 3$$

$$0.5x = 6$$

Then, divide both sides by 0.5 to solve for $x$.

$$\frac{0.5x}{0.5} = \frac{6}{0.5}$$

$$x = 12$$

The answer is 12.

The actual length of the classroom is 12 feet.

**Examples**

**Example 1**

Remember the playground to scale?
Consider the earlier drawing of the playground’s scale: 1″ = 20′.

First, set up a proportion. The scale in the drawing says that 1″ = 20′, therefore the proportion is:

\[
\frac{1 \text{ inch}}{20 \text{ feet}}
\]

Next, write the second ratio. You know the scale length is 7″ inches. The unknown length is \(x\).

\[
\frac{1 \text{ inch}}{20 \text{ feet}} = \frac{7 \text{ inches}}{x \text{ feet}}
\]

Then, cross-multiply to solve for \(x\).

\[
\frac{1}{20} = \frac{7}{x}
\]

\[
1x = 20 \times 7
\]

\[
x = 140
\]

The answer is 140.
The actual width of the playground is 140 feet.

**Example 2**

The image below shows the fountain in front of a hotel. The diameter of the fountain is 4 centimeters. What is the actual diameter of the fountain?

The image shows a fountain with a diameter of 4 cm and a scale of 1 cm = 0.5 meters.
First, set up a proportion. The scale for the image says that $1 \ cm = 0.5 \ m$, therefore the proportion is:

$$\frac{1 \ cm}{0.5 \ m}$$

Next, write the second ratio. You know the scale length is 4 cm. The unknown length is $x$.

$$\frac{1 \ cm}{0.5 \ m} = \frac{4 \ cm}{x \ m}$$

Then, cross-multiply to solve for $x$.

$$\frac{1}{0.5} = \frac{4}{x}$$
$$1x = 0.5 \times 4$$
$$x = 2$$

The answer is 2.
The actual diameter of the fountain is 2 m.

**Example 3**

If the scale said $\frac{1}{2}' = 4$ feet, what would be the inches drawn for a room $8' \times 12'$?

First, set up a proportion. The scale in the drawing says that $\frac{1}{2}' = 4'$, therefore the proportion is:

$$\frac{0.5 \ inches}{4 \ feet}$$

Next, write the second ratio. You know the scale length is $8'$ inches. The unknown length is $x$.

$$\frac{0.5 \ inches}{4 \ feet} = \frac{x \ inches}{8 \ feet}$$

Then use the same ratio to find the other unknown length.

$$\frac{0.5 \ inches}{4 \ feet} = \frac{x \ inches}{12 \ feet}$$

Then, cross-multiply for both ratios.

$$\frac{0.5}{4} = \frac{x}{8} \quad \frac{0.5}{4} = \frac{x}{12}$$
$$4x = 0.5 \times 8 \quad 4x = 0.5 \times 12$$
$$4x = 4 \quad 4x = 6$$

Then, divide both sides to solve for $x$. 

4
\[
\begin{align*}
4x &= 4 & 4x &= 6 \\
\frac{4x}{4} &= \frac{4}{4} & \frac{4x}{4} &= \frac{6}{4} \\
x &= 1 & x &= 1.5
\end{align*}
\]

The answers are 1 and 1.5.
The scale dimensions are 1'' × 1.5''.

**Example 4**

If the scale said \( \frac{1}{2}'' = 4 \) feet, what would be the inches drawn for a room 20' × 28'?

First, set up a proportion. The scale in the drawing says that \( \frac{1}{2}'' = 4' \), therefore the proportion is:

\[
\frac{0.5 \text{ inches}}{4 \text{ feet}} = \frac{x \text{ inches}}{20 \text{ feet}}
\]

Next, write the second ratio. You know the scale length is 8' inches. The unknown length is \( x \).

\[
\frac{0.5 \text{ inches}}{4 \text{ feet}} = \frac{x \text{ inches}}{20 \text{ feet}}
\]

Then use the same ratio to find the other unknown length.

\[
\frac{0.5 \text{ inches}}{4 \text{ feet}} = \frac{x \text{ inches}}{28 \text{ feet}}
\]

Then, cross-multiply for both ratios.

\[
\frac{0.5}{4} = \frac{x}{20} \quad \frac{0.5}{4} = \frac{x}{28}
\]

\[
4x = 0.5 \times 20 \quad 4x = 0.5 \times 28
\]

\[
4x = 10 \quad 4x = 14
\]

Then, divide both sides to solve for \( x \).

\[
\begin{align*}
4x &= 10 & 4x &= 14 \\
\frac{4x}{4} &= \frac{10}{4} & \frac{4x}{4} &= \frac{14}{4} \\
x &= 2.5 & x &= 3.5
\end{align*}
\]

The answers are 2.5 and 3.5. Therefore the scale dimensions are 2.5'' × 3.5''.

**Example 5**

If the scale said \( \frac{1}{2}'' = 4 \) feet, what would be the inches drawn for a room 16' × 24'?

First, set up a proportion. The scale in the drawing says that \( \frac{1}{2}'' = 4' \), therefore the proportion is:
Next, write the second ratio. You know the scale length is 8′ inches. The unknown length is $x$.

\[
\frac{0.5 \text{ inches}}{4 \text{ feet}} = \frac{x \text{ inches}}{16 \text{ feet}}
\]

Then use the same ratio to find the other unknown length.

\[
\frac{0.5 \text{ inches}}{4 \text{ feet}} = \frac{x \text{ inches}}{24 \text{ feet}}
\]

Then, cross-multiply for both ratios.

\[
\begin{align*}
\frac{0.5}{4} &= \frac{x}{16} \\
4x &= 0.5 \times 16 \\
4x &= 8
\end{align*}
\]

\[
\begin{align*}
\frac{0.5}{4} &= \frac{x}{24} \\
4x &= 0.5 \times 24 \\
4x &= 12
\end{align*}
\]

Then, divide both sides to solve for $x$.

\[
\begin{align*}
4x &= 8 \\
4x &= 12
\end{align*}
\]

\[
\begin{align*}
\frac{4x}{4} &= \frac{8}{4} \\
\frac{4x}{4} &= \frac{12}{4} \\
x &= 2 \\
x &= 3
\end{align*}
\]

The answers are 2 and 3.

The scale dimensions are 2′′ × 3′′.

**Review**

This floor plan shows Bonnie’s house. Use it to answer the following questions.
1. The width of the bedroom on the floor plan measures 1.5 inches. What is the actual width of the bedroom?
2. The length of the kitchen on the floor plan measures 3 inches. What is the actual length of the kitchen?
3. The study measures 2 inches by 1.5 inches on the floor plan. What is the actual area of the study?
4. The study measures 2 inches by 1.5 inches on the floor plan. What is the actual perimeter of the study?
5. The study measures 2 inches by 1.5 inches on the floor plan. What are the actual dimensions of the study?
6. If the length of the bedroom is the same as the study, what are the actual dimensions of the bedroom?
7. What is the area of the bedroom?
8. What is the actual length of the outside of the house?
9. A square measures 10 inches on each side. What is its area?
10. If the scale is 1” = 50 ft, what is the actual side length of the same square?
11. What is its area?
12. A classroom measures 21 feet by 15 feet. A second classroom has a similar shape but the dimensions are \( \frac{1}{5} \) as long. How does the area of the second classroom compare to the area of the first classroom?
13. What are the dimensions of the second classroom?
14. Yuri’s backyard has an area of 1,000 square feet. The dimensions of Kyle’s backyard are all \( \frac{1}{3} \) the size of Yuri’s. What is the area of Kyle’s backyard?
15. Mary’s yard is double the area of Kyle’s backyard. What is the area of Mary’s yard? what would be the inches drawn for a room

**Review (Answers)**

To see the Review answers, open this PDF file and look for section 4.8.